

The birth, life and death of convective plumes generated by a green laser in an isothermal fluid

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Abstract

The aim is to laboratory simulation of convective plumes in the lower mantle, generated by a hot spot on the Earth's core. In the fluid dynamics video, presented results of experimental modeling of the plume from the hot point generated by the laser. Demonstrated that in a fluid with a high Prandtl number, point heating can generate complex spiral plumes. This experimental result allows us to question the classical notion of a mantle plume, as the column of heat (Campbell, IH, 2006, Large Igneous Provinces and the mantle plume hypothesis, Elements, 1, 265-269, 2006).

1. Experiment 1. Convective plume generated by a green laser in an water, Prandtl number $Pr=7$. Cubic cavity $25 \times 25 \times 25$ cm.
2. Experiment 2. Spiral convective plume generated by a green laser in an silicon oil with Prandtl number $Pr=50$. Cubic cavity $9 \times 9 \times 9$ cm.
3. Purpose of investigation: Laboratory scale modeling of mantle plumes generation from hot point on Earth core.
4. Equipment: 0.2W green laser, shlieren dev IAB-451, digital photo camera Canon EOS 50D.